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ABSTRACT

Data from referential communication studies with children four, five, and seven years old were examined with respect to metaphorical productions. Speakers in the task were 24 "primed" four-year-old children and 72 "nonprimed" four-, five-, and seven-year-old children equally divided by age. Priming consisted of asking questions that would elicit knowledge that was relevant to the task at hand, which involved describing photographs of dogs and of people's faces to an adult listener. Feedback of a verbal and visual form was provided. Vocabulary was assessed in a posttest. Analyses of variance revealed that the "primed" four-year-old children produced significantly more metaphors than the nonprimed groups. Results were examined with respect to the priming procedure's ability to promote verbal creativity in young children. (Author/RL)

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Young Children's Metaphorical Productions in a Referential Communication Task

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Running Head: Metaphorical Productions

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Young Children's Metaphorical Productions
in a Referential Communication Task

Data from two studies of referential communication with 4, 5, and 7 year olds were examined with respect to metaphorical production. Referential communication involves describing an object well enough that another person can pick that object out of an array of objects (Glucksberg et al, 1975). Language which has reference as its focus would not seem conducive to metaphoric production. Yet unconventional but appropriate figures of speech are frequently elicited by abstract stimulus sets utilized in referential communication paradigms (cf. Glucksberg, 1975). However, in the present study the stimulus sets were photographs of everyday objects--pictures of human emotional expressions (Ekman and Friesen 1975) and pictures of dogs. Given such common objects, how could metaphorical language contribute to a task in which the goal would seem to be to communicate shared conceptualizations, not original ones? In order to answer this question, preschoolers, kindergartners and second graders' descriptions on a referential communication task were examined with an eye towards their metaphorical content and their informativeness. Particular attention was paid to the descriptions made by a subgroup of the 4 year olds who had received a pre-experimental priming condition.

The priming procedure consisted of asking general probes about how people's faces differ from one another, and how dogs differ from one another and specific probes about how one photograph differs from another. It was anticipated that the priming experience would elicit knowledge in the child's head which was relevant to the task at hand.

A definitional classification is in order regarding the notion of metaphorical production. Traditionally, metaphors involve some tension or lack of shared features between the topic and vehicle. For example, in

the metaphor "American society is a fruit salad, not a melting pot" there is a certain amount of tension between the topic "American society" and the vehicles "fruit salad" and "melting pot" if these terms are taken literally. But metaphor is often described as involving the non-literal use of language, in which the intended proposition is mediated by a comparison of two distinct conceptual domains (Fraser, 1979). According to the "semantic feature spaces" notion of metaphor (Sternberg et al, 1979), the distances between these conceptual spaces will affect the aesthetic quality and the comprehensibility of the metaphor.

In contrast to an emphasis on semantics when defining metaphor, is the emphasis on pragmatics, the study of speech acts and the contexts in which they occur. From a pragmatics point of view, metaphors are recognized as such only through the contexts in which they occur. But at an even more fundamental level than the distinctions between literal and non-literal and pragmatic and semantic is the issue of the underlying psychological processes involved. Rumelhart (1979) takes a constructivist point of view when minimizing the need for extraordinary explanations for metaphor. He points out that children naturally produce metaphor as they acquire a language, and therefore, metaphor is a normal linguistic phenomenon. The perspective taken by this author is constructivist as well as pragmatic. To the extent that we as speakers are attempting to construct or reconstruct our view of reality in communicating an idea to a listener, we are seeking linguistic representations which, given contextual cues, will be interpretable. Put into a broader theory of reference, in our attempt as speakers of a language to communicate our intentions we create extensions or referents, which may or may not be shared by our listeners. The definition of metaphor lies in the

external judge's view of appropriate tension between the expressed intension (i.e., the topic) and the expressed extension. But, ultimately, the listener is the judge by the very nature of his or her response.

In this study the mode of presentation and construction of the referent-nonreferent array maximized a constructivist approach to metaphor. The referent photographs invited a certain amount of tension between "topic" and "vehicle" because they were selected so that no one-label message would readily apply. The referent dog photographs were pictures of mutts, while the referent photographs of human emotional expressions (Ekman and Friesen, 1975) were comprised of multiple emotions involving happiness, sadness, fear, anger, surprise, disgust, and contempt. Each referent was presented to the speaker in isolation, while the listener viewed a nonreferent array comprised of the referent and three "high agreement" photographs (i.e., purebred dogs or clear human emotional expressions). The primary rationale for presenting the referent in isolation instead of in the context of the entire array was an appeal to ecological validity: in the real world the pool of nonreferents available to a listener is rarely evident to the speaker. Part of the task of a competent speaker is figuring out what features are potentially relevant to the communication. In short, in attempting to image the potential nonreferent comparisons, the speaker must construct linguistic representations which take these potentially relevant comparisons into account.

One way for the speaker to encode these comparisons linguistically, while dealing with the lack of a single label to apply to the referent, is to give a feature-analytic description. An example of a feature-analytic description for one of the facial expressions might be "It's a man with dark hair and

dark eyes;" for one of the dog photographs it might be "It's big and brown and has a long tail." Non-feature-analytic descriptions are coded as holistic or part-inferential (cf. Heider, 1971). Holistic descriptions are encodings which attempt to capture the gestalt of an object. A holistic encoding for one of the facial expressions might refer to a relatively conventional emotional expression, such as "she's real mad," or to a more novel encoding, such as "he looks like Frankenstein." For the dog photographs a relatively conventional holistic encoding might be "It looks like a wolf," while an unusual one would be "It looks like a dinosaur dog." In addition to these holistic encodings are part-inferential descriptions which encode a feature with an image. Examples are: "his eyes look worried," for one of the facial expressions; and, "a tail like a 'c'" for one of the dog photographs. Taken together, these holistic and part-inferential encodings were considered from a constructivist perspective, as metaphorical productions.

Method

Subjects

The study involved 96 4, 5, and 7 year olds from middle-class families where English was the dominant language. There were 24 5 and 7 year olds from an elementary school in Piedmont, California, and 48 4 year olds from preschools in Davis, California. The 4 year olds were divided into experimental and control groups, with the experimental group receiving a pre-experimental treatment in which features relevant to the communication task were primed. The average age for the preschoolers during the time of the study was 4;5, while for the kindergarteners it was 5;6 and for the school graders it was 7;7.

There were two experimenters. In the case of the 5 and 7 year old sub-

jects, the author served as the listener in the communication task and administered the pre- and posttest; another adult female was present during the communication task to give directions and take note of non-verbal behavior. In the case of the 4 year olds, a female graduate student in Human Development served as a listener and collected the posttest data and one of the pretest measures, while a male Human Development undergraduate helped collect pretest data and served as the observer in the communication task.

Task Description and Procedure

Pretest - All subjects received a mental attentional energy measure called the Cucui test (Diaz, 1974). The Cucui test consisted of twenty-six pictures of Mr. Cucui, a potato man. The first six pictures were for practice. In each picture different parts of Mr. Cucui's body were colored. The subject was shown each picture for five seconds and then asked to place on an outline of Mr. Cucui an "X" on the places where Mr. Cucui had been wearing colors. The more spots of colors a subject could remember, the greater the subject's short term memory and, hence, mental processing capacity. The number of colors Mr. Cucui was wearing in the test items varied randomly from one to four. There were five items at each of these four levels. The test was used to refine the factor of grade level by excluding from the preschool, kindergarten, and second grade sample any subject whose performance fell outside a specified range for the average number of schemes capable of being coordinated at age 4, 5-6, and 7-8 (cf. Pascual-Leone, 1970).

In addition to the Cucui test, half of the 4 year olds received a pre-experimental priming treatment consisting of a series of probes asked in the

context of the practice trial for each stimulus set. General probes asked "How are people's faces different from one another?" or "How are dogs different from one another?" When General Probes no longer elicited information from the subject, Specific Probes were asked about the difference between pairs of pictures: "How do these two faces differ?" or "How do these two dogs differ?" Specific Probes were asked until a subject failed to respond. The experimenter completed the priming procedure with the General Probe, "Can you think of any other way that people's faces (dogs) are different from one another?"

Main test: Communication task - The goal of the referential communication task was to describe in isolation a black and white photograph of a dog, or person's facial expression well enough that the adult listener could pick out the referent from among an array of nonreferent photographs of the same stimulus set. The task instructions were nearly identical for both sets of stimulus materials. For example, for dogs the instructions were: "Pretend that you lost your dog and you have to go to the dog pound to see if you can get it back. You must tell the dog catcher what it looks like and she will look at the dogs that are in the pound to see if she can find it." If the speaker's spontaneous initial encoding was not adequate for distinguishing the referent from the nonreferent array, two forms of feedback were provided by the listener 1) Non-specific verbal feedback of the form "I still don't know which one it is. Is there anything else you can tell me about it?" and, if an adequate description was still not given; 2) Specific, visual contrasts (i.e., nonreferents) that fit the description already provided by the subject but were inconsistent with respect to those relevant features not yet mentioned.

In sum, the communication task consisted of two stimulus sets presented in the two possible orderings to groups of subjects who were counterbalanced for grade level. Each stimulus set consisted of six items, the first one being a practice item. The influence of item order was taken into consideration by having two random orders within each stimulus order. Each item involved four photographs in the referential array, the referent and three nonreferents.

Posttest - The posttest revealed the extent of a subject's repertoire of values for specific features by posing questions about the referent photographs of the communication task (e.g., "How does the tail look?"). All subjects were tested on all features listed in the feature matrices (see scoring and Treatment of Data) so that the spontaneously produced vocabulary from the communication task could be correlated with that produced on demand in the posttest. There was approximately a four-week time lapse between administration of the main test and posttest for a subject.

Scoring and Treatment of Data

Pretest - Scores for the Cucui test were generated in the following manner: One point was assigned if 4 out of 5 times in a level were "passed;" 1/5 of a point was added for any other item scored perfectly.

Scoring procedures for the priming treatment consisted of dividing responses to General and Specific Probes into Categories and Values. A Category was a response that named a feature, such as hair color or length of tail. A Value gave the specific attribute of a feature, such as "black" or "short tail." Subjects' scores were then reported in terms of the proportion of the total number of General and Specific Probes that were Categories and Values.

Communication task - Audio-tapes of the communication task were transcribed and scored according to several dependent variables. Consideration was given to the adequacy of the speaker's initial description for distinguishing the referents from the nonreferents, the relevancy of the features mentioned, and the number of steps of listener feedback required before an adequate description was produced. If a speaker's initial description enabled the listener to distinguish the referents from the nonreferents, the description was scored as one adequate initial encoding. For any one subject the potential range of adequate initial encoding within stimulus sets was 0 to 5. If a speaker's initial encoding did not differentiate the referent from the nonreferents four steps of feedback were available: 1 step of feedback corresponded to non-specific feedback (i.e., "I still don't know which one it is. Is there anything else you can tell me about it?"); 2, 3, and 4 steps of feedback corresponded to specific, visual contrasts. Thus, on any one trial a subject's feedback score could range from 0 to 4. Obviously, if 0 steps of feedback were required, then the subject had an adequate initial encoding.

The scoring criterion for relevant features was determined by a score of 1 for every feature mentioned which was in the relevant matrix for each stimulus set. The matrices contained such conventional features as: hair color, size, orientation, and length/position of ears and tail for dogs. These matrices also noted the non-analytic categories called Holistic and Part-inferential, the two categories of metaphorical productions. As noted earlier, Holistic encodings included such conventional gestalts as "She looks like she's about to hit her kid," and "It looks like a pig." Part-inferentials described a specific feature with an image, such as "His ears

look like they had an operation," and "His tail is like a snake going down a tree." Holistic and Part-inferential encoding were totalled for each subject and represented as a proportion of the total number of relevant features produced per stimulus set. If a feature was so universal or so personalized as not to help distinguish the referent from the nonreferents (e.g., "She has a nose," or "This dog looks like my dog.") it was coded as an irrelevant feature. On any one trial the scores for relevant features ranged from 0 on up.

Posttest - The scoring procedure for relevant features mentioned in the posttest utilized the same relevant feature matrices as were used in the main communication task.

Inter-rater reliability coefficients of .90 - .99 were obtained for the coding of relevant features and Holistic and Part-inferential encodings.

Results

Communicative Informativeness

Analyses of variance were performed on the dependent variables adequate intial encodings, (potentially) relevant features, steps of feedback, and relevant features in the pottest. Table 1 presents the table of means and Table 2 presents the significant results for each dependent variable for the stimulus sets dogs and faces. These stimulus sets were analyzed separately since previous work (Foorman, 1977, Note 1) indicated different encoding styles for descriptions of dogs. Facial expressions tended to be described holistically (e.g., "He looks sad"), while pictures of dogs tended to be described analytically (e.g., "It's big and brown, with a long tail").

Insert Tables 1 and 2

Examination of Table 2 reveals significant group differences in the variable adequate initial encodings for dogs ($F(3,88) = 3.46$, $p < .02$), relevant features for faces ($F(3,88) = 20.42$, $p < .00$) and dogs ($F(3,88) = 12.10$, $p < .00$), and relevant features in the posttest for faces ($F(3,88) = 22.35$, $p < .01$) and dogs ($F(3,88) = 15.91$, $p < .01$). Post-hoc analysis, utilizing Scheffe, revealed relatively little difference between the groups of 7 year olds, 5 year olds, 4 year old primed subjects (4P), and 4 year old nonprimed subjects (4P), except in the posttest measure of vocabulary. Significant group differences may be summarized in the following manner, where ">" indicates significantly "greater than" and "≯" indicates "not significantly greater than."

	Faces		Dogs
Adeq. Init. Encodings			7≯5≯4P≯4nP; 7>4nP
Relevant Features	7≯5>4P≯4nP		7≯5;5≯4P; 5>5nP
Posttest	7>5>4P≯4nP	Dogs>Faces	7>5>4P≯4nP

We can see from the results of the posttest that all subjects had more vocabulary terms for the dog photographs than the facial expressions. In addition, we see that 7 year olds had a significantly greater vocabulary repertoire than 5 year olds, that 5 year olds' repertoire was significantly greater than 4 year

olds', and that the primed and non-primed 4 year olds did not differ significantly. Given these vocabulary differences, the relative lack of age level differences in the communication task is striking. There were no group differences in the variable steps of feedback, nor in adequate initial encodings for faces. In terms of adequate initial encodings for dogs, the only significant group difference lay between 7 year olds and 4 year old non-primed subjects. In the variable relevant features the significant group differences for faces lay between the 7 and 5 year olds versus both groups of 4 year olds, while for dogs the significance lay between the 5 and 7 year olds and the non-primed 4 year olds.

In sum, age seemed to be a good predictor of vocabulary effectiveness, accounting for 42% of the explained variation in posttest performance. However, in terms of the informativeness of the descriptions given prior to feedback and with feedback, age was not very indicative of performance. In the case of significant group differences in adequate initial encodings for dogs, age accounted for only 5% of explained variance. However, in the case of group differences in relevant features, age was more indicative of performance, accounting for 29% of explained variance for dogs and 40% for faces.

Significant Trials effects depicted in Table 2 will not be presented since trend analysis revealed the patterns to be typical learning curves (i.e., quadratic and quartic) and there were no group differences in these patterns.

Metaphorical Productions

Group differences in metaphorical productions were examined by representing each subject's total number of holistic and part-inferential encodings for each stimulus set as a proportion of the total number of relevant features produced. The resulting distributions were highly skewed, thereby suggesting a nonparametric analysis of the data. The proportion of metaphorical productions for the descriptions of dogs was so small for each group that a chi-square analysis was performed, contrasting "no metaphors" to "some metaphors" (i.e., one or more metaphor produced per subject). The result was no significant difference between groups ($\chi^2_3 = 6.75$, $p < .08$).

However, there were significant group differences in the number of metaphors produced in describing facial expressions. A one-way analysis of variance, utilizing the Kruskal-Wallis statistic, revealed significant group differences between mean ranks of 61.40 for the 4 year primed subjects, 44.19 for the non-primed 4 year olds, 47.90 for the 5 year olds, and 40.52 for the 7 year olds ($\chi^2_3 = 7.70$, $p \leq .05$). Post-hoc contrasts indicated that the four year old primed group was producing significantly more metaphors than the non-primed four year olds or the seven year olds. These primed subjects were not, however, producing significantly more metaphors than the 5 year olds. Table 3 breaks the number of metaphors produced by each age group for facial expressions into categories of Holistic and Part-inferential and, within that, into Conventional

and Novel.

Insert Table 3

Holistic-Conventional metaphors were metaphors which applied a single, relevant label to the facial expressions, even though the referent photographs were not easily described by a single label. The labels most frequently chosen were "worried," "sad," "mean," "frightened," "scared," "glad," and "smiling." These same labels, when applied to specific features, were called Part-inferential-Conventional encodings (e.g., "scary mouth, "happy teeth" and "sad eyes).

Metaphors which were categorized as Holistic-Novel were either unusual but relevant one-label descriptions, such as "Frankenstein," "gorilla," "witch," or "Indian," or were phrases describing imminent action. Examples of such phrases were: "starting to cry;" "about to scare someone;" "he's not so sure what they're doing;" and "she looks like she's going to bite you." Novel descriptions for Part-inferential metaphors included: "teeth going 'eee;" "eyebrows like a clown;" and "ears like he had an operation." Inter-rater reliability coefficients for these classifications ranged from .93 for the coding of Conventional and Novel categories within Holistic encodings and .98 for the coding within Part-inferentials.

Examination of Table 3 shows that 15% of the 4 year old

primed subjects' relevant encodings were metaphorical in nature, compared to 9% for the non-primed four year olds, 7% for the 5 year olds, and 5% for the 7 year olds. These percentages reflect the significant difference between the 4 year old primed subjects and 7 year olds revealed in the analysis of variance but do not suggest the significant difference between the two groups of 4 year olds. The reason for this discrepancy is that the data was ranked for the analysis of variance so that a ratio of 0 metaphors to 1 relevant feature was less than 0 metaphors to 2 relevant Features. Consequently, the 4 year old non-primed subjects received relatively low ranks because of their lower number of relevant features and metaphors produced, but proportionately their total metaphorical production to total relevant feature production is relatively higher.

The other striking part about Table 3 is the "15" in the Part-inferential-Conventional column for the 4 year old primed subjects and the "17" in the Holistic-Novel column for the 5 year olds. The primed 4 year olds' higher production of metaphors lies in the Conventional category of Holistic and Part-inferential encodings. Therefore, priming appears to enhance metaphorical production in the area of Conventional metaphors. The relatively high number of Holistic-Novel encodings is not readily explainable except to say that the one-third of the 5 year old subjects who were responsible for these productions were each producing several metaphors.

Discussion

The 4 year old primed subjects' impressive performance

in the area of metaphoric production is tempered by their relatively less impressive performance in the area of informativeness of the message. 15% of the relative features produced by the 4 year old primed subjects, compared to 9% for the non-primed 4 year olds, 7% for the 5 year olds, and 5% for the 7 year olds were metaphoric. Yet the percentage of the descriptions which were sufficiently informative to make listener feedback unnecessary was 37% for the 4 year old primed subjects, compared to 26% for the 4 year old non-primed subjects, 25% for the 5 year olds, and 44% for the 7 year olds.

These percentages, based on relevant features, are further clarified by considering the percentage of features produced which were irrelevant to the task: 13% for the primed 4 year olds; 14% for the non-primed 4 year olds; 10% for the 5 year olds; and 4% for the 7 year olds; (cf., Foorman, 1977, Note 1 and Foorman, 1979, Note 2). The irrelevant features produced were either so universal in nature as not to be discriminating (e.g., "This person has a nose") or so personalized as not to be informative (e.g., "This person looks like my mother"). These personalized encodings were, in fact, metaphorical in the holistic sense described above. But these personalized encodings constitute such a small percentage of total encodings that their importance is minimal: 1% for the primed 4 year olds; 6% for the non-primed 4 year olds; 2% for the 5 year olds; and 1% for the 7 year olds.

The conclusion to be drawn from these percentages is that

although 56% to 75% of the initial descriptions produced by subjects, required feedback, 86% to 96% of all features produced in these initial encodings were relevant to the task. Of these relevant encodings, 85% to 95% were feature analytic in nature. But the fact that metaphors were produced at all in a task that would seem to value analytic encodings is worthy of note. And the fact that the 4 year old primed subjects were producing significantly more metaphors for encodings of facial expressions than both the non-primed 4 year olds and the 7 year olds is particullarly interesting. True, the majority of the Holistic and Part-inferential encodings produced by this primed group were categorized as Conventional. But given the real-world nature of the stimulus materials it is not surprising that conventional rather than novel metaphors were chosen. The price for novelty was clearly displayed by the reaction to one seven year old's description of "This looks like a gorilla." When the adult listener repeated this encoding with a surprised intonation, the child replied, "Because . . . I don't know. Ok, I'll describe it." She then proceeded to analyze the holistic description "gorilla" into specific features. But there was a slight tone of disappointment in her voice, as if to say "I gave you the best description, but now, if you insist, I will break it down."

The ability of the priming procedure to enhance metaphoric

production on the communication task was not anticipated. The general Probes (i.e., "How are people's faces different from one another?) and the Specific Probes (i.e., "How are these two faces different from one another?") resulted in the production of category names and values which seemed to transfer to the communication task in the form of holistic and part-inferential encodings. The important point here is the possibility of the priming technique as an educational training device in promoting verbal creativity. Some recent data collected by the author suggest that the priming procedure may not significantly increase the informativeness of messages until age 7, but if production of relevant metaphors is significantly increased at age 4, then the procedure would appear extremely worthwhile at the preschool and kindergarten level.

A big question remains for further research, however: If the increase in primed 4 year olds' metaphorical productions is a result of lack of sufficient experience in the world to construct conventional feature matrices, then what will happen to metaphorical production as experience grows with increased age? We may have to encourage the task understanding which says that metaphorical speech can not only be an adequate means of communicating, but at times it can also be a more effective means of communicating.

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Table 1

Table of Group Means for

Communication Measures for each Stimulus Set

Dependent Variable	Group 1	2	3	4
Adequate Initial Encoding				
Dogs	.25	.34	.27	.47
Faces	.28	.39	.36	.44
Relevant Features				
Dogs	1.84	2.27	3.27	4.23
Faces	1.61	2.11	3.21	4.12
Steps of Feedback				
Dogs	1.67	1.51	1.61	1.07
Faces	1.90	1.45	1.58	1.17
Relevant features in the Posttest				
Dogs	3.92	3.92	4.62	5.48
Faces	3.47	3.47	4.90	5.81

	Trials 1	2	3	4	5
Adequate Initial Encodings					
Dogs	.28	.46	.27	.38	.28
Faces	.21	.29	.58	.38	.37
Relevant Features					
Dogs	2.69	3.07	3.03	2.99	3.02
Faces	2.30	2.70	2.88	2.86	2.87
Steps of Feedback					
Dogs	1.83	1.09	1.58	1.19	1.64
Faces	2.11	1.54	.98	1.48	1.50

Note: Group 1 = 4 year old non-primed group
2 = 4 year old primed
3 = 5 year olds
4 = 7 year olds

Table 2

ANOVA Results for Four Dependent Variables and Two Stimulus Sets

Dependent Variable	Stimulus Sets	
	Faces	Dogs
Adequate Initial Encodings	Tr.($F_{4,352}$)=11.15	Group($F_{3,88}$)=3.46 P<.02
Relevant Features	Group($F_{3,88}$)=20.42, P<.00 Tr.($F_{4,352}$)=5.55 P<.00	Tr.($F_{4,352}$)=3.76, P<.005 Group($F_{3,88}$)=12.1 P<.00
Steps of Feedback	Tr.($F_{4,352}$)=13.44, P<.00	Tr.($F_{4,352}$)=9.23 P<.000
Posttest	Groups F(3,88) = 22.35, P<.01 Sets F(9,396) = 30.11, P<.01	

Note. - Because analyses were conducted separately for dogs and faces the significance level was divided in half:

$$\frac{\alpha}{2} = \frac{.05}{2} = .025.$$

Tr = Trials

Scheffe's statistic at $\alpha = .05$ is 2.87

Table 3

Age Group Totals for Categories of Metaphors for Facial Expressions

Age	Holistic		Part-inferential		T	T	
	Conven.	Novel	Conven.	Novel	Meta.	Relfeat	%
4P	51	8	15	2	76	522	15
4nP	28	2	4	2	36	416	9
5	37	17	1	1	56	787	7
7	43	8	2	1	54	1003	5

Note. - 4P = 4 year old primed
4nP = 4 year old non-primed
Conven. = Conventional
Meta. = Total metaphors
T Relfeat = Total relevant features
% = (Total metaphors/Total relevant features) X 100